Introduction: Why a Book on Model Writeups?

Note: This module is published by NCPEA Press and is presented as an NCPEA/Connexions publication. Each chapter has been peer-reviewed, accepted, and endorsed by the National Council of Professors of Educational Administration (NCPEA) as a significant contribution to the scholarship and practice of education administration. Formatted and edited in Connexions by Theodore Creighton and Brad Bizzell, Virginia Tech and Janet Tareilo, Stephen F. Austin State University.

- **John R. Slate** is a Professor at Sam Houston State University where he teaches Basic and Advanced Statistics courses, as well as professional writing, to doctoral students in Educational Leadership and Counseling. His research interests lie in the use of educational databases, both state and national, to reform school practices. To date, he has chaired and/or served over 100 doctoral student dissertation committees. Recently, Dr. Slate created a website, Writing and Statistical Help to assist students and faculty with both statistical assistance and in editing/writing their dissertations/theses and manuscripts.
- **Ana Rojas-LeBouef** is a Literacy Specialist at the Reading Center at Sam Houston State University where she teaches developmental reading courses. She recently completed her doctoral degree in Reading, where she conducted a 16-year analysis of Texas statewide data regarding the achievement gap. Her research interests lie in examining the inequities in achievement among ethnic groups. Dr. Rojas-LeBouef also assists students and faculty in their writing and statistical needs on the Writing and Statistical website, Writing and Statistical Help

Introduction

In the past two decades of teaching basic and advanced statistical procedures, we have observed student after student who experienced difficulty with using the Statistical Package for the Social Sciences (SPSS) and with interpreting the voluminous output generated by SPSS. That is the primary reason we wrote our book, Calculating Basic Statistical Procedures in SPSS: A Self-Help and Practical Guide to Preparing Theses, Dissertations, and Manuscripts. We have also noted that almost all of our students experienced tremendous difficulty in determining how to write statistical results up in a meaningful manner and in a way compliant with the *American Psychological Association Publication Manual* (6th edition, 2010). Initially, we wrote short paragraphs to assist students. Over time, however, we learned that providing a complete written results section, with tables, and with the actual statistical output used to generate the results section yielded better reports by students. As such, we have included a model statistical writeup for each chapter in the Calculating Basic Statistical Procedures in SPSS: A Self-Help and Practical Guide to Preparing Theses, Dissertations, and Manuscripts book. By following the step-by-step nature of each model writeup, readers will be able to write their own results section in a manner compliant with APA 6th edition.

Persons who are familiar with the steps in conducting basic statistical procedures in SPSS may still experience difficulties in writing their results up properly. As a co-editor of *Research in the Schools* (John) and reviewers for several journals, we have observed time and time again poorly written results sections in which numeric phrases were missing; in which results were misinterpreted; and in which APA guidelines were not followed. As such, we believe that theses/dissertation/manuscript writers who have conducted basic statistical procedures in SPSS will find our writeups very helpful as they develop their own results section.

We hope that you find our materials helpful to you when you incorporate SPSS statistical output into an interpretable and intelligible results section. This companion book reflects our efforts and interests in making the writing of statistical analyses less threatening and less anxiety-producing than many persons find it to be. In the current times, great emphasis is placed on

accountability in educational settings. Being able to communicate statistical information in a meaningful way to an audience is essential, especially if we want to make the educational lives of our students better.

- John R. Slate, Sam Houston State University
- Ana Rojas-LeBouef, Sam Houston State University

Writing Up Descriptive Statistics

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Writing Up Your Descriptive Statistics

Author Information

- **John R. Slate** is a Professor at Sam Houston State University where he teaches Basic and Advanced Statistics courses, as well as professional writing, to doctoral students in Educational Leadership and Counseling. His research interests lie in the use of educational databases, both state and national, to reform school practices. To date, he has chaired and/or served on over 100 doctoral student dissertation committees. Recently, Dr. Slate created a website, Writing and Statistical Help to assist students and faculty with both statistical assistance and in editing/writing their dissertations/theses and manuscripts.
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Rojas-LeBouef also assists students and faculty in their writing and statistical needs on the Writing and Statistical website, Writing and Statistical Help

The following is an example of how to write up (in manuscript text) your descriptive statistics. This module is used with a larger Collection (Book) authored by John R. Slate and Ana Rojas-LeBouef from Sam Houston State University and available at: *Calculating Basic Statistical Procedures in SPSS: A Self-Help and Practical Guide to Preparing Theses, Dissertations, and Manuscripts*

- **Intelligence Test Scores of Students with Disabilities**

Research Questions

The following research questions were addressed in this study: (a) Of the five groups of elementary school students in this study, which group had the most participants, which group had the second most participants, and which group had the fewest participants? How many participants comprised the total sample for this study?; (b) How did these students perform on the three scores of: Full Scale IQ, the Verbal IQ, the Performance IQ?; (c) To what extent were students' scores normally distributed on the Full Scale IQ, the Verbal IQ, and the Performance IQ?; (d) How well or how poorly did the boys score on the Full Scale IQ, the Verbal IQ, and on the Performance IQ?; (e) How well or how poorly did the boys score on the Full Scale IQ, the Verbal IQ, and on the Performance IQ?; and (f) Without using the words statistically or significantly, compare girls' scores with the boys' scores.

Results

In this research investigation, the total number of participants was 1,789 students. Of the five groups of students whose scores were analyzed in this study, the largest group consisted of 702 students with listening disorders, with the second largest group being 605 students with a label of Other Health Impaired. The fewest participants were in the group of students with a label of Muscular Dystrophy (n = 275). For these five groups of students, students with muscular dystrophy obtained the highest scores on the

Performance IQ (*M* = 92.66) and the lowest scores on the Full Scale IQ (*M* = 70.12). Readers are referred to Table 1 for the descriptive statistics concerning the IQ test scores.

Regarding the normality of the three IQ scores analyzed in this study, the standardized skewness coefficients (i.e., skewness divided by the standard error of skewness) and the standardized kurtosis coefficients (i.e., kurtosis divided by the standard error of kurtosis) were all within the range of +/- 3 (Onwuegbuzie & Daniel, 2002). With all standardized coefficients being within the +/- 3 range, students' performance on the three IQ measures were determined to be normally distributed. Readers are referred to Table 2 for the standardized coefficients concerning normality of the IQ test scores.

Finally for the last three research questions, the scores of girls and boys were compared. Both girls and boys performed below the average score on the IQ measure (*M* = 100). Girls scored higher than boys on the Verbal IQ, the Performance IQ, and on the Full Scale IQ. The difference between girls and boys was greatest on the Verbal IQ, where boys outperformed girls by 13 points, and lowest on the Performance IQ, where girls only outperformed boys by 2 points. Readers are referred to Table 3 for the descriptive statistics for the three IQ measures by gender.

References

Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools, 9*(1), 73-90.

Note: To be compliant with APA 6th edition, students and faculty are to be aware that Table titles are placed "above" the table entry. Titles here are placed below the tables because of special formatting templates and for conciseness of visual presentation.

Cognitive Measure	M	SD
Full Scale IQ	77.73	13.54
Verbal IQ	77.97	13.66
Performance IQ	81.14	14.01

Descriptive Statistics for Student IQ Scores

Cognitive Measure	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
Full Scale IQ	-1.28	0.89
Verbal IQ	2.03	0.76
Performance IQ	-0.99	0.55

Standardized Skewness Coefficients and Standardized Kurtosis Coefficients for Students' IQ Scores

	Boys		Girls	
Cognitive Measure	M	SD	M	SD

Full Scale IQ	69.52	15.21	85.88	3.34
Verbal IQ	90.12	18.91	76.99	23.03
Performance IQ	87.99	23.65	89.12	44.31

*Descriptive Statistics for Cognitive Scores by Gender*Descriptive Statistics for Cognitive Scores by Gender

Output from SPSS

Note: Tables 4, 5, and 6 below came directly from SPSS output. As such, they are not compliant with APA 6th edition and should not be used in theses, dissertations, or manuscripts. Only Tables 1, 2, and 3 above the Output from SPSS are compliant with APA format.

Frequency		Percent	Valid Percent		Cumulative Percent
Valid	Students with Listening Disorders	702	42.5	42.5	42.5
Students with Muscular Dystrophy		275	23.3	23.3	65.7
Students Labeled as Other Health		605	34.3	34.3	100.0

Impaired				
Total	1789	100.0		100.0

Disability Group Membership

	Wechsler Full Scale IQ 3	Verbal IQ	Performance IQ (Wechsler Performance Intelligence 3)
n	1789	1789	1789
Missing	0	0	2
Mean	70.12	77.97	92.66
Std. Deviation	13.541	13.661	14.005
Skewness	-.279	.028	-.177
Std. Error of Skewness	.071	.071	.071
Kurtosis	.212	.142	.072
Std. Error of Kurtosis	.142	.142	.142

Statistics

Gender	Wechsler Full Scale IQ 3	Verbal IQ (Wechsler Verbal Intelligence 3)	Performance IQ (Wechsler Performance Intelligence 3)	
Boys n	522	522	567	
Missing	0	0	2	
Mean	79.52	80.12	82.17	
Std. Deviation	13.512	13.908	13.653	
Skewness	-.253	.033	-.217	
Std. Error of Skewness	.101	.101	.101	
Kurtosis	.374	.291	.255	
Std. Error of Kurtosis	.201	.201	.201	
Girls n	734	734	732	
Missing	0	0	0	
Mean	75.88	75.75	80.07	
Std. Deviation	13.339	13.031	14.307	
Skewness	-.327	-.046	-.120	

Std. Error of Skewness	.101	.101	.101	
Kurtosis	.037	-.084	-.069	
Std. Error of Kurtosis	.201	.201	.201	

Statistics

Writing Up Chi-square

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Writing Up Your Chi-Square

About the Authors

- **John R. Slate** is a Professor at Sam Houston State University where he teaches Basic and Advanced Statistics courses, as well as professional writing, to doctoral students in Educational Leadership and Counseling. His research interests lie in the use of educational databases, both state and national, to reform school practices. To date, he has chaired and/or served over 100 doctoral student dissertation committees. Recently, Dr. Slate created a website, Writing and Statistical Help to assist students and faculty with both statistical assistance and in editing/writing their dissertations/theses and manuscripts.
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The following is an example of how to write up (in manuscript text) your Chi-Square statistics. This module is used with a larger Collection (Book) authored by John R. Slate and Ana Rojas-LeBouef from Sam Houston State University and available at: *Calculating Basic Statistical Procedures in SPSS: A Self-Help and Practical Guide to Preparing Theses, Dissertations, and Manuscripts*

Gender Differences in Reading Group Membership

Research Question

The following research question was addressed in this investigation: What is the difference between boys and girls in their reading group membership?

Results

To ascertain whether a difference was present in reading group membership (i.e., Excellent, Good, Extremely Poor) between boys and girls, a Pearson chi-square was conducted. This statistical procedure was viewed as the optimal statistical procedure to use because frequency data were present for reading group membership and for gender. As such, chi-squares are the statistical procedure of choice when both variables are categorical. In addition, with the large sample size, the available sample size per cell was more than five. Therefore, the assumptions for utilizing a chi-square were met.

For this research question in which the focus was placed on reading group membership between boys and girls, the result was statistically significant, $\chi 2(2) = 122.86$, $p < .001$. The effect size for this finding, Cramer's *V*, was moderate, .32 (Cohen, 1988). As can be seen in Table 1, 47.30% of the girls were in the Excellent Reader group, compared to only 21.4% of the boys. Most of the boys were in the Extremely Poor Reader group, 57.40%, compared to only 27.30% of the girls.

Reference

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Note: To be compliant with APA 6th edition, students and faculty are to be aware that Table titles are placed "above" the table entry. Titles here are placed below the tables because of special formatting templates and for conciseness of visual presentation.

Reading Group	Girls *n* and %ageof Total	Boys *n* and %ageof Total
Excellent Reader	47.30% (*n* = 279)	21.40% (*n* = 126)
Good Reader	25.40% (*n* = 150)	21.20% (*n* = 125)
Extremely Poor Reader	27.30% (*n* = 161)	57.40% (*n* = 338)

Frequencies and Percentages of Reading Group Membership by Gender

SPSS Statistical Output

Note: Tables 2, 3, and 4 below came directly from SPSS output. As such, they are not compliant with APA 6th edition and should not be used in theses, dissertations, or manuscripts. Only Table 1 above the Output from SPSS is compliant with APA format.

	Value	df	Asymp. Sig. (2-sided)

Pearson Chi-Square	**122.856[a]**	**2**	**.000**
Likelihood ratio	125.706	2	.000
Linear-by-Linear Association	121.427	1	.000
N of Valid Cases	1179		

Chi-Square Testsa. 0 cells (.0%) have expected count less than 5. The minimum expected count is 137.38.

		Value	Approx. Sig.
Nominal by Nominal	Phi	.323	.000
	Cramer's V	**.323**	.000
N of Valid Cases		1179	

Symmetric Measures

		Excellent Reader	Good Reader	Extremely Poor Reader	Total
Gender of Persons	Boys Count	126	125	338	589

in Study					
	% within Gender	21.4%	21.2%	57.4%	100%
	Girls Count	279	150	161	590
	% within Gender	47.3%	25.4%	27.3%	100%
Total	Count	405	275	499	1179
	% of total	34.4%	23.3%	42.3%	100%

Gender of Persons in Study

Writing Up Parametric Pearson Correlation

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Writing Up Your Parametric Pearson Correlation

About the Authors

- **John R. Slate** is a Professor at Sam Houston State University where he teaches Basic and Advanced Statistics courses, as well as professional writing, to doctoral students in Educational Leadership and Counseling. His research interests lie in the use of educational databases, both state and national, to reform school practices. To date, he has chaired and/or served over 100 doctoral student dissertation committees. Recently, Dr. Slate created a website, Writing and Statistical Help to assist students and faculty with both statistical assistance and in editing/writing their dissertations/theses and manuscripts.
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statistical needs on the Writing and Statistical website, [Writing and Statistical Help]

The following is an example of how to write up (in manuscript text) your Pearson Correlation statistics. This module is used with a larger Collection (Book) authored by John R. Slate and Ana Rojas-LeBouef from Sam Houston State University and available at: *Calculating Basic Statistical Procedures in SPSS: A Self-Help and Practical Guide to Preparing Theses, Dissertations, and Manuscripts*

College-Readiness Rates in Reading and Math: Are They Related?

Research Question

The following research question was addressed in this investigation: What is the relationship between Texas high school students' college-readiness rates in reading and in math for the 2007-2008 school year?

Results

Prior to conducting correlational procedures, the scatterplot (present in the Appendix) was examined and was clearly suggestive of a bivariate linear relationship between the two variables. No departure from a linear relationship was evident, thereby justifying the use of a correlation coefficient. Regarding the underlying distribution of scores for college-readiness rates in reading and in math, the standardized skewness coefficients (i.e., the skewness value divided by the standard error of skewness) and the standardized kurtosis coefficients (i.e., the kurtosis value divided by the standard error of kurtosis) were calculated and yielded values that were well within the range of normality (i.e., +/- 3, Onwuegbuzie & Daniel, 2002). Readers are directed to Table 1 for the values of these standardized coefficients. Because all four coefficients were reflective of normally distributed data, a parametric correlation procedure, specifically the Pearson's product-moment correlation coefficient, was calculated.

To determine whether a statistically significant relationship was present between Texas students' college-readiness rates in reading and math, a Pearson *r* was calculated. For the 2007-2008 school year, the finding was statistically significant, $r(1371) = .69$, $p < .001$, indicating the presence of a strong statistically significant positive relationship between college-readiness rates in reading and in math. Using Cohen's (1988) values, this *r* value was reflective of a large relationship. Squaring this *r* value indicated that college-readiness rates in reading and in math overlapped 47.61%.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools*, *9*(1), 73-90.

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Variable	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
Reading Readiness Rates	-1.63	-1.61
Math Readiness	-1.39	0.18

Rates		

Standardized Skewness Coefficients and Standardized Kurtosis Coefficients for College-Readiness Rates in Reading and in Math for All Texas High School Students

Variable	n	M	SD
Reading Readiness Rates	1377	53.91	16.09
Math Readiness Rates	1376	54.08	16.26

Descriptive Statistics for College-Readiness Rates in Reading and in Math for All Texas High School Students

SPSS Statistical Output

Note: Figures 1, 2, and 3 below came directly from SPSS output. As such, they are not compliant with APA 6th edition and should not be used in theses, dissertations, or manuscripts. Only Tables 1 and 2 above the Output from SPSS is compliant with APA format.

Figure 1. Scatterplot of Reading Readiness Rates with Math Readiness Rates. Linearity is clearly present

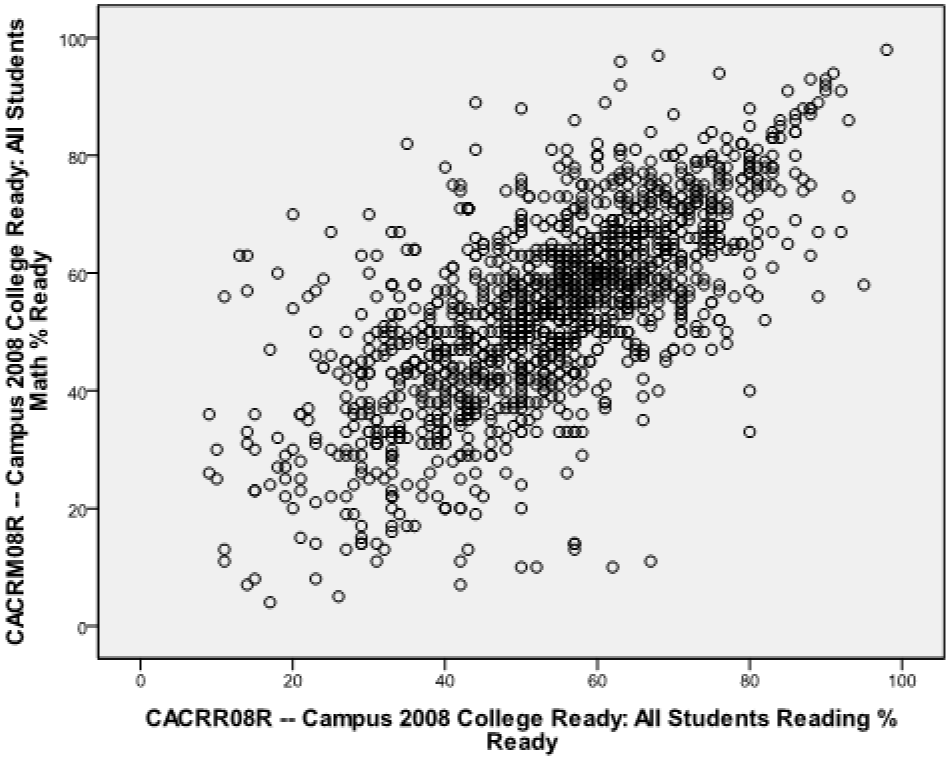

Figure 2

Statistics

		Campus 2008 College Ready: All Students **Reading** % Ready	Campus 2008 College Ready: All Students **Math** % Ready
N	Valid	1377	1376
	Missing	581	582
Mean		53.91	54.08
Std. Deviation		16.086	16.260
Skewness		-.140	-.268
Std. Error of Skewness		.086	.166
Kurtosis		-.184	.024
Std. Error of Kurtosis		.132	.132

Figure 3

Correlations

		CACRM08R -- Campus 2008 College Ready: All Students Math % Ready	CACRR08R -- Campus 2008 College Ready: All Students Reading % Ready
CACRM08R -- Campus 2008 College Ready: All Students Math % Ready	Pearson Correlation	1	**.686******
	Sig. (2-tailed)		**.000**
	N	1376	**1371**
CACRR08R -- Campus 2008 College Ready: All Students Reading % Ready	Pearson Correlation	.686**	1
	Sig. (2-tailed)	.000	
	N	1371	1377

**. Correlation is significant at the 0.01 level (2-tailed).

Writing Up Nonparametric Spearman rho Correlation

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Writing Up Your Nonparametric Spearman rho Correlation

About the Authors

- **John R. Slate** is a Professor at Sam Houston State University where he teaches Basic and Advanced Statistics courses, as well as professional writing, to doctoral students in Educational Leadership and Counseling. His research interests lie in the use of educational databases, both state and national, to reform school practices. To date, he has chaired and/or served over 100 doctoral student dissertation committees. Recently, Dr. Slate created a website, Writing and Statistical Help to assist students and faculty with both statistical assistance and in editing/writing their dissertations/theses and manuscripts.
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Rojas-LeBouef also assists students and faculty in their writing and statistical needs on the Writing and Statistical website, Writing and Statistical Help

The following is an example of how to write up (in manuscript text) your Spearman rho Correlation statistics. This module is used with a larger Collection (Book) authored by John R. Slate and Ana Rojas-LeBouef from Sam Houston State University and available at: *Calculating Basic Statistical Procedures in SPSS: A Self-Help and Practical Guide to Preparing Theses, Dissertations, and Manuscripts*

Relationships of Economically Disadvantaged and Minority Student Enrollment in Texas Middle Schools

Research Questions

The following research questions were addressed in this study:

a. What is the relationship between the percent of economically disadvantaged students and the percent of minority students enrolled at Texas middle schools for the 2003-2004 school year?;
b. What is the relationship between the percent of economically disadvantaged students and the percent of minority students enrolled at Texas middle schools for the 2004-2005 school year?; and
c. What is the relationship between the percent of economically disadvantaged students and the percent of minority students enrolled at Texas middle schools for the 2005-2006 school year?

Results

Sample sizes, means, and standard deviations pertaining to the two variables of interest (i.e., percent of economically disadvantaged students and percent of minority students) for all three years are presented in Table 1. An examination of the scatterplots (not presented) suggested the presence of linearity for the two variables for each of the three years of data analyzed. The presence of linearity permitted the use of correlation coefficients. With respect to the distribution of scores underlying these

measures, the standardized skewness coefficients (i.e., skewness divided by the standard error of skewness) and the standardized kurtosis coefficients (i.e., kurtosis divided by the standard error of kurtosis) revealed serious departures from normality for the two variables of interest for all three years of data analyzed. Specifically, for the percent of economically disadvantaged students, the standardized skewness coefficients were -202.38, -146.81, and -146.52, for each of the three years respectively. Similarly, the standardized kurtosis coefficients for the percent of economically disadvantaged students were -6.65, -6.48, and -10.86 for each of the three years respectively.

Concerning the standardized skewness coefficients for the percent of minority student enrollment, all three coefficients were outside of the limits of normality, -111.43, -162.24, and -130.92 for the 2003-2004, 2004-2005, and 2005-2006 school years respectively. The standardized kurtosis coefficients for minority student enrollment were -10.77, -10.92, and -6.74 for each of the three years respectively. Therefore, all six standardized skewness coefficients and all 6 standardized kurtosis coefficients were outside of the limits of normality, +/- 3, and were indicative of serious departures from normality (Onwuegbuzie & Daniel, 2002). Accordingly, a nonparametric procedure, the Spearman's rank order correlation coefficient (i.e., Spearman's rho) was performed to address each research question previously delineated.

The Spearman's rho revealed a statistically significant relationship between the percent of economically disadvantaged students and the percent of minority students enrolled in Texas middle schools during the 2003-2004 school year ($rs[1528] = .76$, $p < .001$). The effect size of this relationship was large (Cohen, 1988). Squaring the correlation coefficients indicated that 58.4% of the variance in the percent of economically disadvantaged students was explained by the presence of minority students. Similarly, 58.4% of the variance in the percent of minority student enrollment was accounted for by the presence of economically disadvantaged students.

For the 2004-2005 school year, the Spearman's rho revealed a statistically significant relationship between the percent of economically disadvantaged students and the percent of minority students enrolled in Texas middle

schools, (rs[1554] = .76, $p < .001$). The effect size of this relationship was large (Cohen, 1988). Squaring the correlation coefficients indicated that 58.2% of the variance in the percent of economically disadvantaged students was explained by the presence of minority students. Similarly, 58.2% of the variance in the percent of minority student enrollment was accounted for by the percent of economically disadvantaged students.

The Spearman's rho revealed a statistically significant relationship between the percent of economically disadvantaged students and the percent of minority students enrolled in Texas middle schools during the 2005-2006 school year (rs[1563] = .78, $p < .001$). The effect size of this relationship was large (Cohen, 1988). Squaring the correlation coefficients indicated that 60.2% of the variance in the percent of economically disadvantaged students was explained by the presence of minority students. Similarly, 60.2% of the variance in the percent of minority student enrollment was explained by the presence of economically disadvantaged students.

In summary, results across the three years of data were consistent. Effect sizes for all three years were large (Cohen, 1988). Moreover, the percent of variance explained by each variable was consistent, ranging from 58.4% to 60.2%. Thus, findings revealed herein were supportive of a consistent relationship between the percent of economically disadvantaged students and the percent of minority students enrolled in Texas middle schools.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools*, *9*(1), 73-90.

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Year and Variable	n	M	SD
2003-2004 School Year			
Economically Disadvantaged	1,528	51.46	26.28
Minority Students	1,528	54.54	31.33
2004-2005 School Year			
Economically Disadvantaged	1,554	54.66	25.60
Minority Students	1,554	56.95	31.03
2005-2006 School Year			
Economically Disadvantaged	1,563	54.70	25.36
Minority Students	1,563	57.88	30.73

Sample Sizes, Means, and Standard Deviations for Percentages of Economically Disadvantaged Students and Minority Student Enrollment for the 2003-2004, 2004-2005, and 2005-2006 School Years

Note: Figures 1, 2, 3, 4, 5, and 6 below came directly from SPSS output. As such, they are not compliant with APA 6th edition and should not be used in theses, dissertations, or manuscripts. Only Table 1 above the Output from SPSS is compliant with APA format.

SPSS Statistical Output

Figure 1. Statistics for the 2003-2004 school year

		Economically Disadvantaged, Percent	Percentage of Minority Students on Middle School Campuses
N	Valid	1528	1528
	Missing	0	0
Mean		51.455	54.5418
Std. Deviation		26.2783	31.33159
Skewness		-12.75	-7.02
Std. Error of Skewness		.063	.063
Kurtosis		-.831	-1.346
Std. Error of Kurtosis		.125	.125

Figure 2. Correlations/Spearman rho for the 2003-2004 school year

			Percentage of Minority Students on Middle School Campuses	Economically Disadvantaged, Percent
Spearman's rho	Percentage of Minority Students on Middle School Campuses	Correlation Coefficient	1.000	.764(**)
		Sig. (2-tailed)	.	.000
		N	1528	1528
	Economically Disadvantaged, Percent	Correlation Coefficient	.764(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1528	1528

Figure 3. Statistics for the 2004-2005 school year

		Economically Disadvantaged, Percent	Percentage of Minority Students Enrolled on Campus
N	Valid	1554	1554
	Missing	0	0
Mean		54.656	56.9502
Std. Deviation		25.6027	31.02597
Skewness		-9.102	-10.059
Std. Error of Skewness		.062	.062
Kurtosis		-.803	-1.354
Std. Error of Kurtosis		.124	.124

Figure 4. Correlations/Spearman rho for the 2004-2005 school year

			Economically Disadvantaged, Percent	**Percentage of Minority Students Enrolled on Campus**
Spearman's rho	Economically Disadvantaged, Percent	Correlation Coefficient	1.000	**.763(**)**
		Sig. (2-tailed)	.	**.000**
		N	1554	**1554**
	Percentage of Minority Students Enrolled on Campus	Correlation Coefficient	.763(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1554	1554

Figure 5. Statistics for the 2005-2006 school year

		Middle School Minority Students Percentage	Economically Disadvantaged, Percent
N	Valid	1563	1563
	Missing	0	0
Mean		57.8774	54.700
Std. Deviation		30.73075	25.3641
Skewness		-9.084	-8.117
Std. Error of Skewness		.062	.062
Kurtosis		-1.347	-.836
Std. Error of Kurtosis		.124	.124

Figure 6. Correlations/Spearman rho for the 2005-2006 school year

			Middle School Minority Students Percentage	Economically Disadvantaged, Percent
Spearman's rho	Middle School Minority Students Percentage	Correlation Coefficient	1.000	.776(**)
		Sig. (2-tailed)	.	.000
		N	1563	1563
	Economically Disadvantaged, Percent	Correlation Coefficient	.776(**)	1.000
		Sig. (2-tailed)	.000	.
		N	1563	1563

Writing Up Parametric Independent Samples t Test

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Writing Up Your Parametric Independent Samples t

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Rojas-LeBouef also assists students and faculty in their writing and statistical needs on the Writing and Statistical website, Writing and Statistical Help

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Elementary School Beginning Teacher Percentages and Teacher Salary: Accountability Rating Differences

Research Questions

In this study, the following research questions were addressed:

a. What is the difference in beginning teacher percentages between Exemplary elementary schools and Academically Unacceptable elementary schools?; and
b. What is the difference in beginning teacher salary between Exemplary elementary schools and Academically Unacceptable elementary schools?

Results

The average percent of beginning teachers employed at Texas Exemplary elementary schools was 5.26%, compared to an average of 11.94% beginning teachers employed at Texas Academically Unacceptable elementary schools. Concerning the average teacher salary of beginning teachers, the mean salary was $40,080.06 for beginning teachers at Exemplary elementary schools whereas the mean salary was $38,414.98 for beginning teachers at Academically Unacceptable elementary schools. Readers are referred to Table 1 for the descriptive statistics concerning these variables.

Prior to conducting inferential statistics to determine whether differences were present between Exemplary and Academically Unacceptable elementary schools in their beginning teacher percentages and beginning teacher salaries, checks were conducted to determine the extent to which the data were normally distributed. Of the standardized skewness coefficients (i.e., the skewness value divided by its standard error) and the standardized kurtosis coefficients (i.e., the kurtosis value divided by its standard error), all were within the limits of normality, +/-3 (Onwuegbuzie & Daniel, 2002). Accordingly, parametric independent samples *t*-tests were conducted to answer the two research questions.

The independent samples *t*-test revealed a statistically significant difference between Exemplary elementary schools and Academically Unacceptable elementary schools in their percent of beginning teachers, $t(49.46) = -4.58$, $p < .001$. This difference represented a large effect size (Cohen's *d*) of 0.83 (Cohen, 1988). Academically Unacceptable elementary schools had a statistically significantly higher percentage of beginning teachers, more than twice as high, than did Exemplary elementary schools.

Regarding beginning teacher salary, the independent samples *t*-test revealed a statistically significant difference between Exemplary elementary schools and Academically Unacceptable elementary schools, $t(50.47) = 2.11$, $p = .04$. This difference represented a small effect size (Cohen's *d*) of 0.31 (Cohen, 1988). Exemplary elementary schools had a statistically significantly higher teacher salary for beginning teachers, $1,665.08 higher, than the beginning teacher salary at Academically Unacceptable elementary schools.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools, 9*(1), 73-90.

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Variable	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
Percent of Beginning Teachers		
Exemplary	1.52	1.78
Unacceptable	2.52	1.34
Average Salary of Beginning Teachers		
Exemplary	-1.38	1.55
Unacceptable	1.92	0.57

Standardized Skewness Coefficients and Standardized Kurtosis Coefficients for Percent of Beginning Teachers and Average Salary of Beginning Teachers

Variable	n	M	SD
Percent of Beginning Teachers			
Exemplary	839	5.26	5.15
Unacceptable	49	11.94	10.13
Average Salary of Beginning Teachers			
Exemplary	647	$40,080.06	$5,576.37
Unacceptable	44	$38,414.98	$5,027.47

Descriptive Statistics for Percent of Beginning Teachers and Average Salary of Beginning Teachers

Note: Figures 1, 2, and 3 below came directly from SPSS output. As such, they are not compliant with APA 6th edition and should not be used in theses, dissertations, or manuscripts. Only Table 1 and 2 above the Output from SPSS is compliant with APA format.

SPSS Statistical Output

Figure 1. Statistics

Accountability Ratings - Extremes			Average Salary of Beginning Teachers	Percent of Beginning Teachers
Exemplary Elementary Schools	N	Valid	647	839
		Missing	193	1
	Mean		40080.06	5.2603
	Std. Deviation		5576.369	5.14837
	Skewness		-.132	.583
	Std. Error of Skewness		.096	.384
	Kurtosis		.454	.837
	Std. Error of Kurtosis		.292	.469
Academically Unacceptable Elementary Schools	N	Valid	44	49
		Missing	6	1
	Mean		38414.98	11.9416
	Std. Deviation		5027.468	10.12902
	Skewness		-.685	.856
	Std. Error of Skewness		.357	.340
	Kurtosis		-.403	.893
	Std. Error of Kurtosis		.702	.668

Figure 2. Independent Samples Test for Percent of Beginning Teachers

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Percent of Beginning Teachers	Equal variances assumed	38.145	.000	-8.214	886	.000	-6.68128	.81337	-8.27763	-5.08492
	Equal variances not assumed			**-4.583**	**49.459**	**.000**	-6.68128	1.45788	-9.61030	-3.75225

Figure 3. Independent Samples Test for Beginning Teacher Salary

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Average Salary of Beginning Teachers	Equal variances assumed	.010	.920	1.928	689	.054	1665.078	863.695	-30.712	3360.869
	Equal variances not assumed			**2.110**	**50.473**	**.040**	1665.078	788.989	80.715	3249.441

Writing Up Parametric Dependent t Test

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Writing Up Your Parametric Dependent t test

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Differences Between Boys' College-Readiness Rates in Reading and in Math

Research Question

The following research question was addressed in this study:

- What is the difference between boys' college-readiness rates in reading and in math?

Results

Prior to conducting inferential statistics to determine whether a statistically significant difference was present between boys' college-readiness rates in reading and in math, checks were conducted to determine the extent to which the data were normally distributed. Of the standardized skewness coefficients (i.e., the skewness value divided by its standard error) and the standardized kurtosis coefficients (i.e., the kurtosis value divided by its standard error), all were within the limits of normality, +/- 3 (Onwuegbuzie & Daniel, 2002). Readers are directed to Table 1 for the specific values of these standardized coefficients. Because the college-readiness rates in reading and in math were normally distributed, a parametric dependent samples *t*-test was conducted to answer the research question.

The parametric dependent samples *t*-test analysis yielded a statistically significant result, $t(1006) = -52.76$, $p < .001$, Cohen's $d = 0.69$. The effect

size for this difference was moderate (Cohen, 1988). Boys had a statistically significantly higher college-readiness rate in math than they did in reading. Depicted in Table 2 are the descriptive statistics for boys’ college-readiness rates in reading and in math.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools*, *9*(1), 73-90.

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Variable	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
Reading Readiness Rates	1.37	0.85
Math Readiness Rates	0.39	-0.93

Standardized Skewness Coefficients and Standardized Kurtosis Coefficients for Boys’ College-Readiness Rates in Reading and in Math

Variable by Years	M	SD
Reading Readiness Rates	39.91	16.28
Math Readiness Rates	50.55	15.97

Descriptive Statistics for Boys' College-Readiness Rates in Reading and in Math

Note: Figures 1 and 2 below came directly from SPSS output. As such, they are not compliant with APA 6th edition and should not be used in theses, dissertations, or manuscripts. Only Table 1 and 2 above the Output from SPSS is compliant with APA format.

SPSS Statistical Output

Figure 1. Statistics

Statistics

		Campus 2008 College Ready: Male Reading % Ready	Campus 2008 College Ready: Male Math % Ready
N	Valid	1008	1021
	Missing	119	106
Mean		39.91	50.55
Std. Deviation		16.278	15.972
Skewness		.380	.030
Std. Error of Skewness		.277	.077
Kurtosis		.131	-.143
Std. Error of Kurtosis		.154	.153

Figure 2. Paired Samples Test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	CMCRB08R – Campus 2008 College Ready: Male Reading Readiness Rates% Ready - CMCRR08R – Campus 2008 College Ready: Male Math Readiness Rates% Ready	-11.033	6.635	.209	-11.443	-10.622	-52.763	1006	.000

Writing Up Nonparametric Independent Samples t Test

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Writing Up Your Nonparametric Independent Samples t

About the Authors

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Gender Differences in Arithmetic Among Grade 4 Students

Research Question

In this study the following research question was addressed:

- What is the effect of gender on Arithmetic scores among Grade 4 students?

Results

An examination of the standardized skewness coefficient (i.e., the skewness value divided by the standard error of the skewness) and standardized kurtosis coefficient (i.e., the kurtosis value divided by the standard error of the kurtosis) revealed serious departures from normality for the dependent variable, Arithmetic, for both boys and girls. Depicted in Table 1 are the four standardized coefficients, all of which were far beyond the boundaries of normality, +/- 3 (Onwuegbuzie & Daniel, 2002).

Because Arithmetic scores for boys and for girls were not normally distributed, a nonparametric (i.e., Mann-Whitney's *U*) independent samples *t*-test was used to compare the Arithmetic scores of boys and girls. The Mann-Whitney *U* test revealed a statistically significant gender difference in Arithmetic scores, $U = 122004.00$, $p < .001$. The Cohen's *d* effect size associated with this difference was 0.40. Using Cohen's (1988) criteria, this finding represented a small-to-moderate effect size. Presented in Table 2 are

the descriptive statistics for Arithmetic scores for boys and for girls. Boys had statistically significantly higher Arithmetic scores than did girls.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools*, *9*(1), 73-90.

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Variable	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
Boys	-11.04	-11.00
Girls	30.41	11.06

Standardized Skewness Coefficients and Standardized Kurtosis Coefficients for Arithmetic Scores by Gender

Gender	n	M	SD
Boys	576	7.07	2.96
Girls	560	6.01	2.36

Sample Sizes, Means, and Standard Deviations by Gender for Arithmetic Scores

Note: Figures 1 and 2 below came directly from SPSS output. As such, they are not compliant with APA 6th edition and should not be used in theses, dissertations, or manuscripts. Only Table 1 and 2 above the Output from SPSS are compliant with APA format.

SPSS Statistical Output

Figure 1. Statistics

Statistics

Verbal 3 (Arithmetic)

Boys	N	Valid	576
		Missing	13
	Mean		7.07
	Std. Deviation		2.959
	Skewness		-1.126
	Std. Error of Skewness		.102
	Kurtosis		-2.234
	Std. Error of Kurtosis		.203
Girls	N	Valid	560
		Missing	30
	Mean		6.01
	Std. Deviation		2.361
	Skewness		3.132
	Std. Error of Skewness		.103
	Kurtosis		2.278
	Std. Error of Kurtosis		.206

Figure 2. Test Statistics

Test Statistics[a]

	Verbal 3 (Arithmetic)
Mann-Whitney U	122004.000
Wilcoxon W	279084.000
Z	-7.152
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Gender of Persons in Study

Writing Up Nonparametric Dependent Samples t Test

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Writing Up Your Nonparametric Dependent Samples t

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College-Readiness Differences in Reading and Math for Asian Students in Texas

Research Question

The following research question was addressed in this study:

- What is the difference in the college-readiness rates in reading and in math for Asian high school students in Texas?

Results

An examination of the standardized skewness coefficients (i.e., the skewness value divided by its standard error) and the standardized kurtosis coefficients (i.e., the kurtosis value divided by its standard error) revealed large deviations from normality. All four standardized coefficients were outside the bounds of normality of +/-3 (Onwuegbuzie & Daniel, 2002). Readers are referred to Table 1 for the specific values for these coefficients.

Because the data for both the college-readiness rates in reading and in math were not normally distributed, a nonparametric statistical procedure had to be utilized. Accordingly, a nonparametric Wilcoxon's dependent samples *t*-test (Huck, 2007) was utilized to address the research question. The Wilcoxon's dependent samples *t*-test yielded a statistically significant difference between Asian students' college-readiness rates in reading and in math, $z = -13.92$, $p < .001$. The effect size associated with this difference,

Cohen’s *d*, was 0.42, small (Cohen, 1988). Asian students demonstrated statistically significantly higher college-readiness rates in math than in reading, 5.99% higher. Depicted in Table 2 are the means and standard deviations for Asian students’ college-readiness rates in reading and in math.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Huck, S. W. (2007). *Reading statistics and research* (5th ed.). New York, NY: Addison Wesley
- Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools*, *9*(1), 73-90.

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Variable	Standardized Skewness Coefficient	Standardized Kurtosis Coefficient
Reading Readiness Rates	-4.91	4.22
Math Readiness Rates	-6.37	3.36

Standardized Skewness Coefficients and Standardized Kurtosis Coefficients for College-Readiness Rates in Reading and in Math for Texas Asian High School Students

Variable	M	SD
Reading Readiness Rates	68.60	15.44
Math Readiness Rates	74.59	13.32

Means and Standard Deviations for Texas Asian High School Students' College-Readiness Rates in Reading and in Math

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Figure 1. Statistics

Statistics

		Campus 2008 College Ready: Asian/Pacific Islander Math %	Campus 2008 College Ready: Asian/Pacific Islander Reading %
N	Valid	268	268
	Missing	1700	1690
Mean		74.59	68.60
Std. Deviation		13.321	15.445
Skewness		-.968	-.732
Std. Error of Skewness		.152	.149
Kurtosis		1.015	1.252
Std. Error of Kurtosis		.302	.297

Figure 2. Test Statistics

Test Statistics[b]

	CPCRM08R -- Campus 2008 College Ready: Asian/Pacific Islander Math % Read - CAMPUS
Z	-13.924[a]
Asymp. Sig. (2-tailed)	.000

a. Based on positive ranks.

b. Wilcoxon Signed Ranks Test

Writing Up Parametric ANOVA

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Writing Up Your Parametric ANOVA

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College-Readiness in Reading: Differences by Accountability Rating

Research Question

The following research question was addressed in this study:

- What is the difference in college-readiness reading rates between Texas high school campuses as a function of accountability rating?

Results

Prior to conducting an inferential statistical procedure, checks for normality of data were conducted. With respect to the distribution of scores underlying college-readiness rates in reading, the standardized skewness coefficients (i.e., skewness divided by the standard error of skewness) and the standardized kurtosis coefficients (i.e., kurtosis divided by the standard error of kurtosis) revealed no serious departures from normality for the variable of interest. Readers are directed to the Appendix where the skewness and kurtosis values are present. By calculating the standardized coefficients, the reader can ascertain that all of the standardized coefficients were within the +/-3 range (Onwuegbuzie & Daniel, 2002). Because these standardized coefficients were indicative of normally distributed data, use of a parametric Analysis of Variance (ANOVA) procedure was justified.

Regarding the extent to which differences might be present in college-readiness rates in reading as a function of school accountability rating (i.e.,

Exemplary, Academically Recognized, Academically Acceptable, and Academically Unacceptable), an ANOVA was calculated. This ANOVA revealed a statistically significant difference, $F(3, 1228) = 97.45$, $p < .001$, $n^2 = .19$. The effect size for this statistically significant difference was large (Cohen, 1988). Scheffe` post hoc procedures revealed that differences were present in college-readiness rates in reading between each pair of accountability ratings. As evidenced in Table 1, college-readiness rates in reading were highest at Exemplary high schools, followed by Academically Recognized high schools. As the accountability rating became poorer, college-readiness rates in reading were statistically significantly lower. Readers are directed to Table 1 for the descriptive statistics for college-readiness rates in reading by school accountability rating.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools*, *9*(1), 73-90.

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Variable	n	M	SD
Exemplary	117	56.51	18.74
Academically Recognized	542	44.47	13.99

Academically Acceptable	501	36.26	12.34
Academically Unacceptable	72	29.13	13.03

Descriptive Statistics for College-Readiness Rates in Reading by Accountability Rating

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SPSS Statistical Output

Figure 1. Statistics

Statistics

Campus 2008 College Ready: All Students Both % Ready

Exemplary schools	N	Valid	117
		Missing	40
	Skewness		-.213
	Std. Error of Skewness		.224
	Kurtosis		-.175
	Std. Error of Kurtosis		.444
Recognized schools	N	Valid	542
		Missing	54
	Skewness		.097
	Std. Error of Skewness		.105
	Kurtosis		.021
	Std. Error of Kurtosis		.209
Academically Acceptable schools	N	Valid	501
		Missing	25
	Skewness		.219
	Std. Error of Skewness		.109
	Kurtosis		.166
	Std. Error of Kurtosis		.218
Academically Unacceptable schools	N	Valid	72
		Missing	4
	Skewness		.189
	Std. Error of Skewness		.283
	Kurtosis		-.785
	Std. Error of Kurtosis		.559

Figure 2. Descriptive Statistics

Descriptive Statistics

Dependent Variable: Campus 2008 College Ready: All Students Both % Ready

Recoded Accountability Rating	Mean	Std. Deviation	N
Exemplary schools	56.51	18.736	117
Recognized schools	44.47	13.991	542
Academically Acceptable schools	36.26	12.344	501
Academically Unacceptable schools	29.13	13.033	72
Total	41.38	15.369	1232

Figure 3. Tests of Between Subjects Effects

Tests of Between-Subjects Effects

Dependent Variable:Campus 2008 College Ready: All Students Both % Ready

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	55911.232[a]	3	18637.077	97.446	.000	.192
Intercept	1053425.999	1	1053425.999	5507.958	.000	.818
RecodedAccountability	55911.232	**3**	18637.077	**97.446**	**.000**	**.192**
Error	234861.466	**1228**	191.255			
Total	2400484.000	1232				
Corrected Total	290772.698	1231				

a. R Squared = .192 (Adjusted R Squared = .190)

Figure 4. Multiple Comparisons

Multiple Comparisons

Campus 2008 College Ready: All Students Both % Ready
Scheffe

(I) Recoded Accountability Rating	(J) Recoded Accountability Rating	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Exemplary schools	Recognized schools	12.04*	1.410	**.000**	8.09	15.99
	Academically Acceptable schools	20.25*	1.420	**.000**	16.27	24.22
	Academically Unacceptable schools	27.39*	2.071	**.000**	21.59	33.19
Recognized schools	Exemplary schools	-12.04*	1.410	.000	-15.99	-8.09
	Academically Acceptable schools	8.21*	.857	**.000**	5.81	10.61
	Academically Unacceptable schools	15.35*	1.735	**.000**	10.49	20.21
Academically Acceptable schools	Exemplary schools	-20.25*	1.420	.000	-24.22	-16.27
	Recognized schools	-8.21*	.857	.000	-10.61	-5.81
	Academically Unacceptable schools	7.14*	1.743	**.001**	2.26	12.02
Academically Unacceptable schools	Exemplary schools	-27.39*	2.071	.000	-33.19	-21.59
	Recognized schools	-15.35*	1.735	.000	-20.21	-10.49
	Academically Acceptable schools	-7.14*	1.743	.001	-12.02	-2.26

Based on observed means.
The error term is Mean Square(Error) = 191.255.

*. The mean difference is significant at the .05 level.

Writing Up Nonparametric ANOVA

Note: This module is published by NCPEA Press and is presented as an NCPEA/Connexions publication. Each chapter has been peer-reviewed, accepted, and endorsed by the National Council of Professors of Educational Administration (NCPEA) as a significant contribution to the scholarship and practice of education administration. Formatted and edited in Connexions by Theodore Creighton and Brad Bizzell, Virginia Tech and Janet Tareilo, Stephen F. Austin State University.

Writing Up Your Nonparametric One-Way ANOVA

About the Authors

- **John R. Slate** is a Professor at Sam Houston State University where he teaches Basic and Advanced Statistics courses, as well as professional writing, to doctoral students in Educational Leadership and Counseling. His research interests lie in the use of educational databases, both state and national, to reform school practices. To date, he has chaired and/or served over 100 doctoral student dissertation committees. Recently, Dr. Slate created a website, Writing and Statistical Help to assist students and faculty with both statistical assistance and in editing/writing their dissertations/theses and manuscripts.
- **Ana Rojas-LeBouef** is a Literacy Specialist at the Reading Center at Sam Houston State University where she teaches developmental reading courses. She recently completed her doctoral degree in Reading, where she conducted a 16-year analysis of Texas statewide data regarding the achievement gap. Her research interests lie in examining the inequities in achievement among ethnic groups. Dr.

Rojas-LeBouef also assists students and faculty in their writing and statistical needs on the Writing and Statistical website, Writing and Statistical Help

The following is an example of how to write up (in manuscript text) your Nonparametric ANOVA test Statistics. This module is used with a larger Collection (Book) authored by John R. Slate and Ana Rojas-LeBouef from Sam Houston State University and available at: *Calculating Basic Statistical Procedures in SPSS: A Self-Help and Practical Guide to Preparing Theses, Dissertations, and Manuscripts*

Differences in Hispanic Student Enrollment as a Function of School Level

Research Question

The following research question was addressed in this study:

- What is the difference in Hispanic student enrollment as a function of school level?

Results

Descriptive statistics for the percent of Hispanic students enrolled in Texas elementary schools, middle schools, and high schools are depicted in Table 1. Prior to conducting an inferential statistical procedure to address the research question previously delineated, checks of the normality of the data were conducted. In particular, the standardized skewness coefficients (i.e., the skewness value divided by its standard error) and the standardized kurtosis coefficients (i.e., the kurtosis value divided by its standard error) were calculated for the percent of Hispanic students enrolled in Texas elementary schools, middle schools, and high schools. As can be seen in Appendix B, all of these values were far outside of the boundaries of normally distributed data (i.e., -3 to +3) (Onwuegbuzie & Daniel, 2002). Thus, a nonparametric analysis of variance (ANOVA) procedure was used. Specifically, the Kruskal-Wallis test was employed.

The nonparametric ANOVA revealed a statistically significant difference in the percent of Hispanic students enrolled in Texas schools as a function of school level, $X2= 75.72$, $p < .001$. The effect size associated with this difference, as measured by Cramer’s *V*, was .07. Using Cohen’s (1988) criteria, this coefficient was indicative of a small effect. A series of nonparametric pairwise follow-up tests at the Bonferroni (Vogt, 2005) adjusted level (i.e., .05 divided by 3 analyses) of .0167 indicated that a statistically significantly higher percentage of Hispanic students were enrolled in elementary schools than in either middle or high schools. Similarly, a higher percentage of Hispanic students were enrolled in middle school than were enrolled in high schools. Readers are directed to Table 1 for the descriptive statistics for Hispanic student enrollment as a function of school level.

References

- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.
- Onwuegbuzie, A. J., & Daniel, L. G. (2002). Uses and misuses of the correlation coefficient. *Research in the Schools, 9*(1), 73-90.
- Vogt, W. P. (2005). *Dictionary of statistics and methodology: A nontechnical guide for the social sciences* (3rd ed.). Thousand Oaks, CA: Sage.

Note: To be compliant with APA 6th edition, students and faculty are to be aware that Table titles are placed "above" the table entry. Titles here are placed below the tables because of special formatting templates and for conciseness of visual presentation.

School Level	n	M	SD

Elementary	4,460	48.86	31.68
Middle	1,661	44.08	30.62
High	1,721	41.45	30.92

Sample Sizes, Means, and Standard Deviations for the Percent of Hispanic Students Enrolled in Texas Schools as a Function of School Level

Nonparametric ANOVA and Effect Size Formulae

- The chi-square value can be used to compute the effect size. Specifically, Cramer's *V* is used, which is defined as Cramer's $V = \sqrt{\chi^2 / (df \times n)}$
- Where χ^2 is the value extracted from the Kruskal-Wallis test, df = degrees of freedom, and n = the sample size.
- For the above data, we have Cramer's $V = \sqrt{75.72 / (2 \times 7842)} = .07$

Note: Figures 1, 2, 3, 4, 5, and 6 below came directly from SPSS output. As such, they are not compliant with APA 6th edition and should not be used in theses, dissertations, or manuscripts. Only Table 1 above the Output from SPSS is compliant with APA format.

SPSS Statistical Output

Figure 1

Statistics

Campus 2009 Student: Hispanic Percent

Elementary Schools	N	Valid	4460
		Missing	0
	Skewness		1.237
	Std. Error of Skewness		.037
	Kurtosis		-1.344
	Std. Error of Kurtosis		.073
Middle Schools	N	Valid	1661
		Missing	0
	Skewness		1.489
	Std. Error of Skewness		.060
	Kurtosis		-1.050
	Std. Error of Kurtosis		.120
Secondary Schools	N	Valid	1721
		Missing	0
	Skewness		.535
	Std. Error of Skewness		.059
	Kurtosis		-.963
	Std. Error of Kurtosis		.118

Figure 2

Descriptive Statistics

Dependent Variable:Campus 2009 Student: Hispanic Percent

Recoded School Level	Mean	Std. Deviation	N
Elementary Schools	48.856	31.6826	4460
Middle Schools	44.076	30.6219	1661
Secondary Schools	41.453	30.9209	1721
Total	46.219	31.4483	7842

Figure 3

Test Statistics[a,b]

	Campus 2009 Student: Hispanic Percent
Chi-Square	75.721
Df	2
Asymp. Sig.	.000

a. Kruskal Wallis Test

b. Grouping Variable: Recoded School Level

Figure 4

Test Statistics[a]

	Campus 2009 Student: Hispanic Percent
Mann-Whitney U	3401672.500
Wilcoxon W	4781963.500
Z	-4.918
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Recoded School Level

Figure 5

Test Statistics[a]

	Campus 2009 Student: Hispanic Percent
Mann-Whitney U	3320071.000
Wilcoxon W	4801852.000
Z	-8.234
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Recoded School Level

Figure 6

Test Statistics[a]

	Campus 2009 Student Hispanic Percent
Mann-Whitney U	1349510.000
Wilcoxon W	2831291.000
Z	-2.810
Asymp. Sig. (2-tailed)	.005

a. Grouping Variable: Recoded School Level

Resources: Examples of Published Write Ups

> **Note:**This module is published by NCPEA Press and is presented as an NCPEA/Connexions publication. Each chapter has been peer-reviewed, accepted, and endorsed by the National Council of Professors of Educational Administration (NCPEA) as a significant contribution to the scholarship and practice of education administration. Formatted and edited in Connexions by Theodore Creighton and Brad Bizzell, Virginia Tech and Janet Tareilo, Stephen F. Austin State University.

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- **John R. Slate** is a Professor at Sam Houston State University where he teaches Basic and Advanced Statistics courses, as well as professional writing, to doctoral students in Educational Leadership and Counseling. His research interests lie in the use of educational databases, both state and national, to reform school practices. To date, he has chaired and/or served over 100 doctoral student dissertation committees. Recently, Dr. Slate created a website, Writing and Statistical Help to assist students and faculty with both statistical assistance and in editing/writing their dissertations/theses and manuscripts.
- **Ana Rojas-LeBouef** is a Literacy Specialist at the Reading Center at Sam Houston State University where she teaches developmental reading courses. She recently completed her doctoral degree in Reading, where she conducted a 16-year analysis of Texas statewide data regarding the achievement gap. Her research interests lie in examining the inequities in achievement among ethnic groups. Dr. Rojas-LeBouef also assists students and faculty in their writing and

statistical needs on the Writing and Statistical website, Writing and Statistical Help

Descriptive Statistics:

For writeups of descriptive statistics within the context of a published article, please see:

- 1. Moore, G. W., & Slate, J. R. (2008). Who's in the Advanced Placement courses and how are they doing? A two-year statewide study. *The High School Journal*, *92*(1), 55-67. doi:10.1353/hsj.0.0013
- In this study, the first research question involved the reporting of descriptive statistics. Moore and Slate (2008) discuss their statistical information in adherence to APA formatting and have several tables in which their descriptive statistics are present.

- 2. Bustamante, R., Slate, J. R., Edmonson, S., Combs, J., Moore, G., & Onwuegbuzie, A. J. (2010). College-Readiness considerations for English Language Learners and students with special learning needs. *International Journal of Educational Leadership Preparation*, *5*(4). Available online at http://www.ncpeapublications.org/volume-5-number-4-july-september-2010/238-college-readiness-for-english-language-learners-and-students-with-special-learning-needs.html
- Bustamante and colleagues (2010) have three research questions that were descriptive in nature. They provide a thorough discussion of their results and provide tables which are APA compliant.

- 3. Clark, D., Slate, J. R., & Viglietti, G. C. (2009). Children's weight and academic performance in elementary school: Cause for concern? *Analyses of Social Issues and Public Policy (ASAP)*, *9*(1), 185-204. doi: 10.1111/j.1530-2415.2009.01186.x Available online at http://www3.interscience.wiley.com/journal/122665434/abstract
- In this study, Clark, Slate, and Viglietti (2009) provide an extensive set of tables in which descriptive statistics regarding the prevalence of obesity in elementary school children were provided. Both basic and complex tables are depicted in the Clark et al. (2009) study.

- 4. Manuel, M., & Slate, J. R. (2003). Hispanic females in the superintendency: A national study. *Advancing Women in Leadership, 7*(1). Available online at http://www.advancingwomen.com/awl/fall2003/MANUEL%7E1.html
- In this article, Manuel and Slate (2003) provide an array of descriptive statistics in which they provide a profile of Hispanic females in the superintendency. Readers will note that the entire study is one of describing superintendents who are Hispanic females. No inferential statistics are present.

Chi-square

For writeups of nonparametric Pearson chi-squares within the context of a published article, please see:

- 1. Moore, G., Slate, J. R., & Martinez-Garcia, C. (2009). Advanced Placement exam performance and Asian students: A national study. *Asian Journal of Educational Research and Synergy (AJERS), 1*(2), 13-23.
- In this study, Moore, Slate, and Martinez-Garcia (2009) used aggregated Advanced Placement data to determine whether statistically significant differences were present between Asian students and White students on their Advanced Placement exam performance. Their chi-square results were reported in detail and in compliance with APA 6th edition formatting.

- 2. Moore, G. W., & Slate, J. R. (2010). Advanced Placement exams and American Indian performance. *American Secondary Education, 38*(2), 73-94.
- In this study, Moore and Slate (2010) used aggregated Advanced Placement data to determine whether statistically significant differences were present between American Indian students and White students on their Advanced Placement exam performance. Their chi-square results were reported in detail and in compliance with APA 6th edition formatting. Readers will note the consistency in reporting of chi-square results across these two studies.

- 3. Clark, D., Slate, J. R., & Viglietti, G. C. (2009). Children's weight and academic performance in elementary school: Cause for concern? *Analyses of Social Issues and Public Policy (ASAP), 9*(1), 185-204. doi: 10.1111/j.1530-2415.2009.01186.x Available online at http://www3.interscience.wiley.com/journal/122665434/abstract
- In this study, Clark, Slate, and Viglietti (2009) report the results of several Pearson chi-square procedures in which they ascertain whether differences were present in the obesity percentages by ethnicity and by gender.

- 4. Wang, Y., Gibson, A., Solis, F., Selinas, L., & Slate, J. R. (2007). Thematic differences in mission statements between four-year institutions and two-year colleges in Texas. *International Electronic Journal of Leadership in Learning.* Available online at http://www.ucalgary.ca/~iejll/volume11/slate.htm
- In this article, Wang, Gibson, Solis, Selinas, and Slate (2007) reported the results of several Pearson chi-squares as they examined differences in mission statements between 4-year and 2-year institutions in Texas.

Correlation:

For writeups of correlation statistics within the context of a published article, please see the following articles. With the exception of the data not being normally distributed and the use of the Spearman *rho* instead of the Pearson *r*, the writeup for correlations and their interpretations are the same, regardless of the specific type calculated.

- 1. Schulte, D. P., & Slate, J. R. (2011). Charter schools: Instructional expenditures and college-readiness. *International Journal of Educational Leadership Preparation, 5*(2). Available online at http://ijelp.expressacademic.org/article.php?autoID=361&issueID=74
- In this study, Schulte and Slate (2011) had three research questions in which correlations were calculated. They indicated that they had checked for linearity and for normality of their data. Statistical significant results were described in adherence with APA 6th edition. Moreover, effect sizes were present.

- 2. Garcia, C., Slate, J. R., & Delgado, C. (2009). Salary and ranking and teacher turnover: A statewide study. International Journal of Education Policy and Leadership, 4(7). Retrieved from http://journals.sfu.ca/ijepl/index.php/ijepl/article/view/114/76
- In this study, Garcia, Slate, and Delgado (2009) report the results of three Pearson *r*s they calculated to address their relationship between teacher salary and teacher turnover. Effect sizes and strength of associations were present in their study.

- 3. Combs, J. P., Clark, D., Moore, G., Edmonson, S. L., Onwuegbuzie, A. J., & Slate, J. R. (2011). Academic achievement for fifth-grade students in elementary and intermediate school settings. *Current Issues in Education, 4*(1). Available online athttp://cie.asu.edu/ojs/index.php/cieatasu/article/view/677
- In this article, Combs et al. (2011) present a correlation matrix in compliance with APA 6th edition style. Moreover, the correlation statistics presented were described thoroughly, along with their effect sizes.

- 4. Jaurequi, J. A., Slate, J. R., & Brown, M. S. (2008). Texas community colleges and characteristics of a growing undocumented student population. *Journal of Hispanic Higher Education, 7*(4), 346-355. doi:10.1177/1054773804271935 Available online at http://JHH.sagepub.com/content/vol7/issue4
- In this study, Jaurequi, Slate, and Brown (2008) examined the relationship between community college size and undocumented student enrollment and the relationship between Hispanic student enrollment and undocumented student enrollment.

Parametric Independent Samples t-test

For writeups of a parametric independent samples *t*-test within the context of a published article, please see:

- 1. Slate, J. R., LaPrairie, K., Schulte, D. P., & Onwuegbuzie, A. J. (2010). Characteristics of effective college faculty: A mixed analysis.

Assessment and Evaluation in Higher Education, 34(1), 1-16. doi:10.1080/02602930903428684

- In this study, Slate, LaPrairie, Schulte, and Onwuegbuzie (2010) conduct four parametric independent samples *t*-tests in their mixed method research study regarding characteristics of effective college faculty. Slate et al. (2010) examined the normality of their data, prior to conducting these statistical procedures, and then reported their results and effect sizes, when statistically significant results were present.

- 2. Schulte, D. P., Slate, J. R., & Onwuegbuzie, A. J. (2008). Characteristics of effective high school teachers: A mixed analysis. *International Journal of Educational Research, 47,* 351-361. doi:10.1016/j.ijer.2008.12.001
- In this study, Schulte, Slate, and Onwuegbuzie (2008) conduct four parametric independent samples *t*-tests in their mixed method research study regarding characteristics of effective high school teachers. Slate et al. (2010) examined the normality of their data, prior to conducting these statistical procedures, and then reported their results and effect sizes, when statistically significant results were present.

Parametric Dependent Samples t-test

For writeups of a parametric dependent samples *t*-test within the context of a published article, please see:

- 1. Slate, J. R., LaPrairie, K., Schulte, D. P., & Onwuegbuzie, A. J. (2009). My best and poorest college teachers: Stories from college students. *Issues in Educational Research.* Available online at http://www.iier.org.au/iier.html
- In this mixed method research study, Slate, LaPrairie, Schulte, and Onwuegbuzie (2009) conducted a parametric paired samples *t*-test to determine whether students wrote a statistically significantly different number of themes for their best college teacher than for their poorest college teacher.

Nonparametric Independent Samples t-test:

For a writeup of a nonparametric independent samples *t*-test (i.e., Mann-Whitney *U*) results, please see:

- 1. Williams, J. S., Beken, J. A., Combs, J. P., & Slate, J. R. (2010). Graduation and attendance rates of at-risk students at traditional and academic alternative high schools: A two-year statewide study. International Journal of Education Leadership Preparation, 5*(2)*. Retrieved from http://ijelp.expressacademic.org/article.php?autoID=368&issueID=74
- In their study, Williams, Beken, Combs, and Slate (2010) have four research questions in which they analyzed for differences between groups. After determining that their data were not normally distributed, they then conducted several nonparametric independent samples *t*-tests. In this study, Williams et al. (2010) reported their statistical results in a manner compliant with APA, as well as provide APA compliant tables.

- 2. Clark, D., Slate, J. R., & Viglietti, G. C. (2009). Children's weight and academic performance in elementary school: Cause for concern? *Analyses of Social Issues and Public Policy (ASAP), 9*(1), 185-204. doi: 10.1111/j.1530-2415.2009.01186.x Available online at http://www3.interscience.wiley.com/journal/122665434/abstract
- In this study, Clark, Slate, and Viglietti (2009) report the results of several nonparametric independent samples t-tests. After documenting that their data were not normally distributed, they conducted Mann-Whitney *U* statistical procedures. In accordance with APA 6th edition, they provided effect size estimates for their statistically significant results.

Nonparametric Dependent Samples t-test:

For writeups of nonparametric Wilcoxon's dependent samples *t*-test (i.e., Wilcoxon signed-ranks test), please see:

- 1. Moore, G. W., & Slate, J. R. (2008). Who's in the Advanced Placement courses and how are they doing? A two-year statewide study. *The High School Journal, 92*(1), 55-67. doi:10.1353/hsj.0.0013
- In this study, the second and third research questions involved determining the extent to which statistically significant differences were present between groups. After calculating measures of normality (i.e., skewness and kurtosis), Moore and Slate (2008) determined that their data were not normally distributed and, as a result, used nonparametric independent samples *t*-tests to address their second and third research questions.

- 2. Bustamante, R., Slate, J. R., Edmonson, S., Combs, J., Moore, G., & Onwuegbuzie, A. J. (2010). College-Readiness considerations for English Language Learners and students with special learning needs. *International Journal of Educational Leadership Preparation, 5*(4). Available online at http://www.ncpeapublications.org/volume-5-number-4-july-september-2010/238-college-readiness-for-english-language-learners-and-students-with-special-learning-needs.html
- Bustamante and colleagues (2010) had one research question that involved differences between paired or dependent groups. After determining that their data were not normally distributed, they conducted several nonparametric dependent *t*-tests.

Parametric Analysis of Variance:

For writeups of parametric ANOVA, please see:

- 1. Schulte, D. P., & Slate, J. R. (2011). Charter schools: Instructional expenditures and college-readiness. *International Journal of Educational Leadership Preparation, 5*(2). Available online at http://ijelp.expressacademic.org/article.php?autoID=361&issueID=74
- In this study, Schulte and Slate (2011) had three research questions in which ANOVAs, of measures of differences, were calculated. They indicated that they had checked for normality of their data. Statistical significant results were described in adherence with APA 6th edition. Moreover, effect sizes were present.

- 2. Garcia, C., Slate, J. R., & Delgado, C. (2009). Salary and ranking and teacher turnover: A statewide study. International Journal of Education Policy and Leadership, 4(7). Retrieved from http://journals.sfu.ca/ijepl/index.php/ijepl/article/view/114/76
- In this study, Garcia, Slate, and Delgado (2009) report the results of three ANOVAs they calculated to determine whether statistically significant differences in teacher turnover were present as a function of school accountability rating. Effect sizes and tables in which descriptive statistics for the groups were present.

Nonparametric Analysis of Variance:

For writeups of nonparametric ANOVA (i.e., Kruskal-Wallis), please see:

- 1. Clark, D., Slate, J. R., & Viglietti, G. C. (2009). Children's weight and academic performance in elementary school: Cause for concern? *Analyses of Social Issues and Public Policy (ASAP)*, *9*(1), 185-204. doi: 10.1111/j.1530-2415.2009.01186.x Available online at http://www3.interscience.wiley.com/journal/122665434/abstract
- In this study, Clark, Slate, and Viglietti (2009) report the results of nine nonparametric ANOVAs. After demonstrating that their data were not normally distributed, they conducted Kruskal-Wallis statistical procedures. In accordance with APA 6th edition, they provided effect size estimates for their statistically significant results.